Amogh Manoj Joshi

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Education

Arizona State University **Aug 2022 - May 2024**

Master's in Computer Science (MS CS); ***GPA: 3.83/4.0***

University of Mumbai **July 2018 - June 2022**

Bachelor of Engineering - Electronics and Telecommunication; ***CGPA: 8.83/10***

Relevant Research Experience

Latent AI Inc. **May 2023 – Aug 2023**

Machine Learning Intern *Princeton, NJ*

- Worked on enabling Intellectual Property Ownership verification using Black-Box Watermarking of DNNs.
- Implemented a fully **Black-Box DNN watermarking** technique which gives 100% success rate with just 10-30% of the training compute cost (takes less than 10 minutes on a single 12 GB GPU of NVIDIA RTX 3070).
- Developed and integrated the same technique as an end-to-end Black-Box watermarking module with Latent AI's flagship LEIP SDK toolkit as an add-on feature.
- Conducted empirical experiments across different **benchmark datasets** and **model architectures** to prove the **robustness** of the watermarking method against variety of **attacks** like FTAL, FTLL, Pruning etc.

Wu Lab, Arizona State University **Aug 2022 – May 2023**

Graduate Research Assistant: Deep Learning *Tempe, AZ*

- Worked on predicting the improvement in aPTH (migraine) patients using a **multi-modal approach** combining functional MRI data and brain T2* imaging data using **Graph Neural Networks (GNNs)**.
- **Improved** the aPTH severity prediction accuracy by a stellar **11.5%** by performing **feature selection** using Boruta ranking algorithm and **SHAPley feature importance** scores.
- Collaborated with medical experts of **Mayo Clinic** and visualized the classification performance of our method to them by generating **3D embeddings** of the final classification layer using **UMAP projection** plots.

Malaviya National Institute of Technology Jaipur **May 2020 – May 2022**

Research Assistant: Deep Learning, Computer Vision *Jaipur, India*

- Worked on **parameter-efficient Deep Learning** approaches with a focus on Multi-scale feature learning for COVID-19 Detection from Chest CT Scans.
- Developed **MFL-Net (only 780K Parameters)** with Multiscale Feature Learning (MFL) modules, extracting features at different depths with a blend of convolutions and residual skip connections.
- MFL-Net achieved a SOTA accuracy of **98.79%** on SARS-CoV-2 CT-Scan dataset apart from being extremely parameter-efficient **(30x and 172x lighter than ResNet-50 and VGG-16 respectively)**
- Developed two more novel approaches: **LiMS-Net** and **GDenseMNet**. All three works got published in respected venues like IEEE Journal of Biomedical and Health Informatics, International Joint Conference on Neural Networks (IJCNN).

Publications

1. **Interpretable deep learning framework towards understanding molecular changes associated with neuropathology in human brains with Alzheimer's disease** [Abstract]
   Alzheimer's Association International Conference (AAIC) 2023
   Amogh Manoj Joshi[1], Jay Shah, Benjamin Readhead, Yi Su, Teresa Wu, Qi Wang
2. **LiMS-Net: A Lightweight Multi-Scale CNN for COVID-19 Detection from Chest CT Scans**
   ACM Transactions on Management Information Systems (2023)
   Amogh Manoj Joshi[1], Deepak Ranjan Nayak, Dibyasundar Das and Yu-Dong Zhang
3. **GDenseMNet: Global Dense Multiscale Feature Learning Network for Efficient COVID-19 Detection in CT Images**
   2022 International Joint Conference on Neural Networks (IJCNN)
   Amogh Manoj Joshi[1], Deepak Ranjan Nayak
4. **MFL-Net: An Efficient Lightweight Multi-Scale Feature Learning CNN for COVID-19 Diagnosis from CT Images**
   IEEE Journal of Biomedical and Health Informatics (2022) (IF:7.021)
   Amogh Manoj Joshi[1], Deepak Ranjan Nayak

5. **A Machine Learning Based Bike Recommendation System Catering To User's Travel Needs**
   17 th IEEE India Council International Conference (INDICON) 2020
   Ananta Kumar Das, **Amogh Manoj Joshi[2]** and Subhasish Dhal
6. **Deep Learning Based Approach For Malaria Detection in Blood Cell Images**
   2020 IEEE Region 10 International Conference (TENCON 2020)
   Amogh Manoj Joshi[1], Ananta Kumar Das and Subhasish Dhal

Research Projects

Finding the label errors in RVL-CDIP Document Classification Dataset | *PyTorch* **Sept 2023 - Present**

- This research project aims at detecting and correcting the labeling errors in RVL-CDIP, a benchmark dataset for document classification, through advanced multi-modal approaches.
- Detecting train-test overlapped images by **image similarity using image embeddings obtained from CLIP**. Also investigating CLIP for **zero-shot classification** for finding the labeling errors.

Evaluating the adversarial robustness of DNNs and ViTs | *PyTorch* **Sept 2022 - Nov 2022**

- This research project aimed at understanding insights about the **architectural nuances** of DNNs and Vision Transformers (ViTs) through the lens of **adversarial robustness.**
- Performed comprehensive experiments encompassing 13 different architectures including **ResNets, ViT-B-6, ViT-B-12**, and two newly proposed architectures: **BaseNets (with traditional linear architecture)** and **MS-Nets (enabling Multi-Scale Feature Extraction)**.
- Evaluated the robustness of the models against **PGD attacks with increasing intensity levels** on two benchmark datasets: CIFAR-10 and MNIST.
- Results proved that **ViTs are highly vulnerable to adversarial attacks when the training data is small** (MNIST and CIFAR-10). Also, DNN models with higher parameters performed poorly on high-intensity attacks than their lighter variants.

Passenger Detection in Bus Transport Service| *Keras, Raspberry Pi, Firebase* **Sept 2021 - Jan 2022**

- Developed a **fully automated passenger count detection system** which captures an aerial view inside the bus using a camera connected to Raspberry Pi.
- Captured and **curated a novel dataset** containing aerial view images inside the bus. The captured image is processed using **Region of Interest (ROI) cropping** to focus on the seats and corridor.
- Trained a **YOLOv5** object detection model to detect number of passengers inside the bus. Also developed an **algorithm** to count the number of empty seats depending on the bus model.

MedDES: The Medical Diagnostic Expert System | *Keras, Streamlit, Heroku* **Jan 2021 - Feb 2021**

- Developed a diagnostic system for medical image diagnosis using deep learning which has four diagnostic tests for Malaria, COVID-19, Pneumonia and Brain Tumour. The system also generates a detailed patient report.
- Built and trained four lightweight CNN models using Keras, one for each diagnostic test. The models are deployed in the system and have an average inference time of 84 milliseconds.

Technical Skills

Languages	- Python, C++, Java, HTML, SQL, SSH, Docker, Kubernetes
Machine Learning	- Keras, TensorFlow, PyTorch, PyTorch Lightning, MONAI, HuggingFace
Python Libraries	- Albumentations, OpenCV, ImageIO, Scikit-learn, Pillow, Numpy, Pandas
Software	- MATLAB, Tableau, Jupyter Lab, Pycharm, VS Code

Awards and Recognition

- Invited to join the prestigious **IEEE HKN (Eta Kappa Nu) ASU Chapter** based on the academic performance and research contributions at Arizona State University [2023]
- Awarded with a **Graduate Research Assistantship** right from the first semester along with a **100% Tuition Scholarship** as a Master's student at Arizona State University [2022]
- Selected for the **5th Summer School on Artificial Intelligence: 2021** organized by **International Institute of Information Technology Hyderabad** from Aug 2 - Aug 31 [2021]
- Selected for **Eastern European Machine Learning (EEML) Summer School 2021** amongst a competitive international pool of 1000+ applicants [2021]
- Selected as one of the six **Student Mentors** in my department. Responsibilities include mentoring junior students academically and providing guidance about their career prospects [2021]